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PATENT SPECIFICATION



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PROVISIONAL SPECIFICATION

Improvements relating to Air Filters

I, GEORGE HENRY ALEXANDER, a British Subject, of 82—84, Coleshill Street, in the City of Birmingham, 4, do hereby declare the nature of this invention to be as follows:—

This invention has for its object to provide an improved air filter for use in mines, factories, public buildings and the like where it is desired to remove dust from the ventilating air.

The invention comprises a mat made from any convenient material to a hollow conical form, in combination with a correspondingly shaped support on one or each side, one or more of such parts being adapted to be mounted in a ventilating-air conduit. In particular the invention comprises a filter as aforesaid in which the mat is impregnated with glycerine or other viscous and innocuous liquid.

In one manner of constructing a filter in accordance with this invention a short length of cylindrical tube is used, this being adapted at one or each end for connection to a ventilating-air conduit, and being preferably of the same cross sectional area as the conduit. Within the pipe is arranged one or a series of filtering elements. The filtering element or each of such elements comprises a hollow conical mat, and this is supported on one or each side by hollow conical members made from perforated sheet metal or wire mesh. The angle at the

apex of the cone is preferably about 40°, and the apex is arranged to point in the direction of the air stream through the conduit. To ensure an air tight connection between the periphery of the filtering element and the inner surface of the pipe, a hollow conical sheet metal annulus having a short cylindrical portion at one end is used, the cylindrical portion being arranged to fit the pipe closely and the conical portion being adapted to enter the open end of the filtering element. When a series of such elements are used they are disposed in the pipe at any convenient distance apart.

The mat or each mat is preferably made from a tangle of thin flat wire of non-corrodible metal, the wire being about .004 inch thick and .02 inch wide. Alternatively the mat may be made from glass wool, wood wool or any similar and suitable fibrous material. Preferably the mat is impregnated with glycerine or other viscous and innocuous material which will promote the adhesion of dust particles to the mat.

By the combination of parts above described a serviceable air filter well adapted for use in mines, or factories or other places where the air is heavily laden with dust, can be produced in a ready and convenient manner.

Dated this 30th day of July, 1935.

MARKS & CLERK.

COMPLETE SPECIFICATION

Improvements relating to Air Filters

I, GEORGE HENRY ALEXANDER, a British Subject, of 82—84, Coleshill Street, in the City of Birmingham, 4, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to an improved apparatus for filtering dust-laden air or other gas, and is particularly adapted for use in mines, although it may be employed for a variety of other uses, for

example, filtering the air passing through the carburettors of internal combustion engines, or the gas supplied to gas burners.

The invention comprises the combination of a conical mat of tangled wire or strip material, and a perforated conical support for the mat.

The dust-laden air stream to be treated is constrained to pass at high speed through the hollow conical filter mat the apex of which is arranged to point in the direction of travel of the air stream,

and the angle at the apex of which is acute. The said filter mat is fixed inside a relatively short section of cylindrical air piping so as to form therewith a filter unit, a plurality of which are readily adapted to be connected in spaced relationship in series with a ventilation pipe line. Each filter mat is fixed in such a manner that its axis is coincident with the axis of said pipe section.

Preferably the said filter units comprise short cylindrical sections of piping of the same diameter as the ventilation piping to which they are to be connected, each end of a section being constructed so as to conform to the normal jointing method used in the piping to which it is to be applied.

The filtering mat which is preferably constructed in one piece is located on a hollow cone of screening material or the like and is fixed to the inside of the above referred to cylindrical section at its base substantially midway between the ends of said section. The thickness of the filtering mat fitted over said inner hollow cone of screening material, is substantially constant through-out, while the angle at the apex is preferably of the order of 40 degrees.

The outside diameter of the base of the filtering mat is made substantially equal to the inside diameter of the cylindrical section. To prevent dust-laden air escaping at this circular area of contact an annular deflecting and locating member is provided. This member is of cylindrical shape for a portion of its length, and is frusto-conical in shape for the remainder of its length. The cylindrical portion is a sliding fit inside the cylindrical section, while the frusto-conical portion projects for a short distance into the hollow interior of the filtering mat. Securing means such as rivets or bolts are employed to fix the whole in position. It will be understood that the angle of the frusto-conical portion is made to coincide exactly with the angle of the inside surface of the wall of the conical filtering member. The edge of the cylindrical portion of the deflecting and locating member is preferably soldered or brazed to the inside surface of the cylindrical section.

In practice a plurality of these filtering units are employed in series at a desired point in the ventilation piping.

To enable the invention to be more readily understood and carried into practice, reference is made to the accompanying sheet of drawings in which like references refer to like parts throughout.

In the drawings:—
Figure 1 is a section through a single

filter unit connected in series with a ventilation pipe line.

Figure 2 is a side elevation showing three filter units assembled in series with one another and with a ventilation pipe line.

Referring to the drawings reference 1 denotes a hollow conical filter mat supported on and fixed to a hollow cone 2 of screening material or the like, which cone is secured to the annular deflecting member 3 which is in turn fixed in known manner to the inside of the short cylindrical pipe section 4. The deflecting member 3 comprises a cylindrical portion 5 and a frusto-conical portion 6 which is arranged to project a short distance inside the filter mat 1. To ensure an airtight contact the back edge of the cylindrical portion 5 is soldered or brazed to the pipe section 4 as shown at 7.

The pipe section 4 with the filter mat 1 and associated parts comprises one complete filter unit, and the ends thereof are beaded to enable said unit to be connected in series with a pipe line 8 by means of the known jointing means 9. The connecting means above described is by way of example only and the ends of the pipe section 4 may be constructed to conform to any other quick release airtight jointing method.

Usually a plurality of filter units will be connected in series with one another and with the pipe line as illustrated in Figure 2 where three filter units 4a, 4b and 4c are shown connected in series with a pipe line 10. The pipe sections 4 are short enough to permit the filter mats 1 to nest into one another as clearly shown.

In certain cases the filtering action of the mats 1 is improved by impregnating them with a water-soluble, hygroscopic viscous organic fluid such as an aqueous solution of glycerine atomised by means of a compressed air atomiser or the like 11 disposed ahead of said mats. Alternatively the mats may be impregnated by merely dipping them into the solution. The arrows 12 indicate the direction of flow of the air stream.

The conical mats 1 consist of a tangle of either fine gauge flattened wire of non-corrodible metal or strip material.

The texture of the mats is such as to present to the air stream, a labyrinth of spaced facets and edges while at the same time being as porous as possible so as to prevent clogging on deposition of dust. The thickness of the filter mat is preferably between $\frac{1}{2}$ " and 3" measured at right angles to its walls.

For efficient working of the apparatus the normal velocity at which the air should be drawn through the filtering

mats is upwards of 500 ft. per minute (measured as normal flow in a pipe of the same diameter as the cylindrical section).

In practice the upper limit of the velocity will be largely governed by considerations such as power, economy, space available, and dust concentration. When it is not possible to provide for a velocity sufficiently high to enable the filter to function efficiently, the effective diameter of the filter may be decreased by continuing the deflecting and locating member further up into the cone until the required constriction is obtained.

Cleansing of the filter mats may be effected by rinsing them in a bath of clean water or they may be washed with a hose, thereby removing the trapped dirt. The mats may then be drained of water, re-impregnated with solution and put into use again.

The filter may be erected at any convenient spot adjacent to or remote from the source of dust, which may be collected and conveyed to the filter by any suitable pipe or ducts.

In cases where heavy concentrations of dust would entail frequent and undesirable stoppages to clean and re-impregnate the mats, or where for any other reason it would be preferable, a spray may be substituted for the compressed air atomiser referred to previously and enough of the impregnating solution sprayed on to the first unit of the series to wash down the dust as it is caught. Provided sufficient air speed is maintained the solution will be carried right through the series of mats, when it may be recovered, preferably by being allowed to impinge on baffles, or by any other suitable means, and led to settling tanks from which the dust may be recovered as slimes and the solution re-circulated by means of a suitable pump.

The apparatus above described and illustrated in the drawings is more especially adapted for use in mines, factories or the like. By appropriate modification of detail the apparatus may be adapted for a variety of other uses.

For filtering gas supplied to gas burners, or the air supplied to engine carburettors, the filter or filters may be arranged in any convenient manner and in any suitable position appropriate to the duty to be performed, but in all cases the filtering element is of conical form as above described.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. An improved air or other gas filter comprising the combination of a conical mat of tangled wire or strip material, and a perforated conical support for the mat, substantially as described.

2. A filter as claimed in Claim 1, and comprising an annular deflecting member adapted to enter the open end of the support, substantially as described.

3. A filter as claimed in Claim 1 and having the form of a unitary structure comprising the combination of a conical mat, a perforated conical support for the mat, an annular deflecting member entering the open end of the support, and a cylindrical pipe section in which the said support and deflecting member are mounted, substantially as described.

4. A filter as claimed in Claim 1 in which a plurality of the conical mats, together with their supports are arranged in spaced relationship and in series with each other, substantially as described.

5. A filter as claimed in Claim 1, in which the mat is impregnated with dust-arresting liquid, substantially as described.

6. A filter as claimed in Claim 1 in combination with means for supplying a spray of dust-arresting liquid on to the filter, substantially as described.

7. A filter as claimed in Claim 1, and comprising the combination and arrangement of parts substantially as described and as illustrated in Figure 1 or 2 of the accompanying drawings.

Dated this 18th day of June, 1936.
MARKS & CLERK.

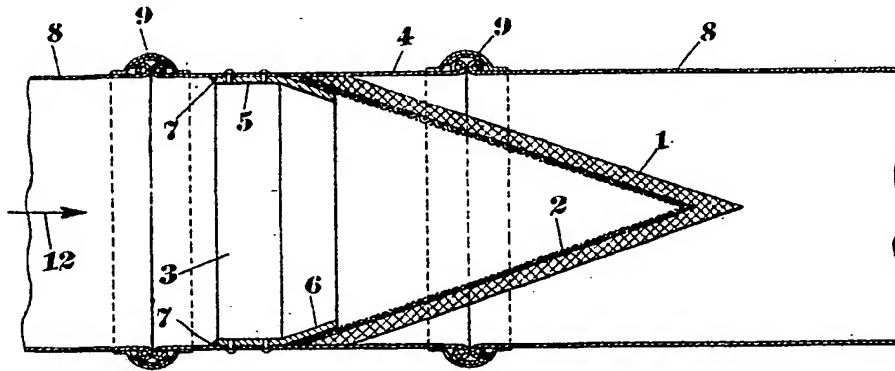


Fig.1

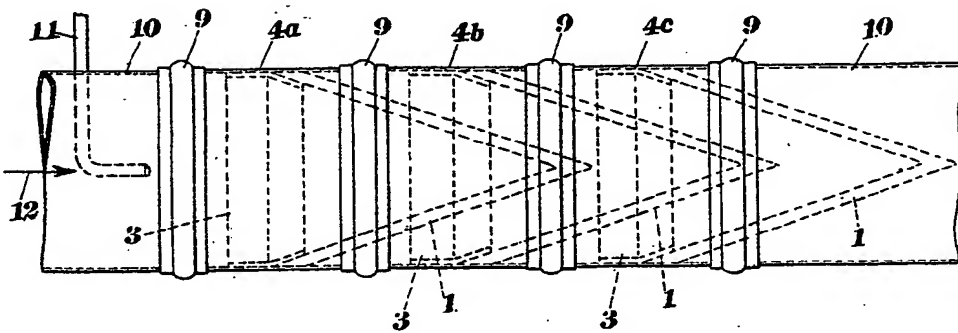


Fig.2

Malby & Sons, Photo-Lith.

[This Drawing is a reproduction of the Original on a reduced scale.]